FORM PTO-1390 (REV. 9-2001) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: P/231-140

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 10/030572

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/CH00/00274	17 May 2000	7 July 1999

TITLE OF INVENTION: Marcel LEISI (SPRAY HEAD)

APPLICANT(S) FOR DO/EO/US: SPRAY HEAD - Marcel LEISI

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto (required only if not communicated by the International Bureau).
   b. [X] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [X] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [X] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] ~~An English language translation of the annexes of~~ the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [ ] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordan
18. [ ] A second copy of the published international application und
19. [ ] A second copy of the English language translation of the inte
20. [X] Other items or information:
    5 sheets of drawings.
    PEFS print form.
    Postcard

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office Addressee (Mail Label EL EL924389514 US) in an envelope addressed to: U.S. Patent and Trademark Office, PO Box 2327, Arlington, VA 22202, on January 3, 2002

Dorothy Jenkins
Name of Person Mailing correspondence

Dorothy Jenkins
Signature

January 3, 2002
Date of Signature

JC13 Rec'd PCT/PTO 03 JAN 2002

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
10/030572	PCT/CH00/00274	P/231-140

21. [x] The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1040.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$740.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	24 - 20 =	4	x **$18.00**	$ 72.00	
Independent claims	1 - 3 =	0	x **$84.00**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$280.00**	$	
TOTAL OF ABOVE CALCULATIONS =				$ 962.00	
[x] Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. +				$ 481.00	
SUBTOTAL =				$ 481.00	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$	
TOTAL NATIONAL FEE =				$ 481.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
TOTAL FEES ENCLOSED =				$ 481.00	
				Amount to be refunded:	$
				charged:	$

a. [x] A check in the amount of $ 481 to cover the above fees is enclosed. Check No. 7984

b. [ ] Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [x] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 15-0700 . A duplicate copy of this sheet is enclosed.

d. [ ] Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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APPLICATION INFORMATION

Title Line One:: SPRAY HEAD
Total Drawing Sheets:: 5
Formal Drawings?:: Yes
Application Type:: Utility
Docket Number:: P/231-140
Secrecy Order in Parent Appl.?:: No

CONTINUITY INFORMATION

This application is a:: 371 OF
> Application One:: PCT/CH00/00274
Filing Date:: 05-17-2000

PRIOR FOREIGN APPLICATIONS

Foreign Application One:: CH 1244/99
Filing Date:: 07-07-1999
Country:: Switzerland
Priority Claimed:: Yes

Source:: PrintEFS Version 1.0.1

P/231-140

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Marcel LEISI

Serial No.:

Filed:

Date: January 3, 2002

Group Art Unit:

Examiner:

For: SPRAY HEAD

U.S. Patent and Trademark Office
P.O. Box 2327
Arlington, VA 22202

Attn: Box PCT (US/DO/EO)

AMENDMENT/SUBMISSION

Prior to examination, please amend the application as follows.

FEE CALCULATION

Any additional fee required has been calculated as follows:

__X__ If checked, "Small Entity" status is claimed.

NO. CLAIMS AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR		EXTRA PRESENT		RATE	ADDIT. FEE
TOTAL 24	MINUS	20	* =	4	X	($9 SE or $18)	$ 36.00
INDEP. 1	MINUS	3	** =	0	X	($42 SE or $84)	$
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					X	($140 SE or $280)	$
* not less than 20 ** not less than 3						TOTAL	$ 36.00

If any additional payment is required, a check which includes the calculated fee of $36.00 (OFGS Check No. _____) is attached.

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

CONTINGENT EXTENSION REQUEST

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. § 1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. § 1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

AMENDMENTS

_X_ If checked, amendment(s) to the specification and/or claims are submitted herewith.

1. ___ If checked, an abstract is submitted as the last page of Appendix A.

2. **Specification:**

Please delete the paragraph(s)/section(s) beginning at page, and replace such paragraph(s)/section(s) pursuant to 37 C.F.R. § 1.121(b)(ii) with the "clean" version attached hereto as Appendix A. Entry is respectfully requested. A version with markings to show the changes made pursuant to 37 C.F.R. § 1.121(b)(iii) is attached hereto as Appendix B.

3. **Claims:**

Please cancel claims _____ without prejudice.

Please amend claims 6 and 20 pursuant to 37 C.F.R. § 1.121(c)(i) as set forth in the "clean" version attached hereto as Appendix A. Entry is respectfully requested. A version with markings to show the changes made pursuant to 37 C.F.R. § 1.121(c)(ii) is attached hereto as Appendix B.

___ If checked, the optional complete set of "clean" claims pursuant to 37 C.F.R. § 1.121(c)(3) is attached hereto as Appendix C.

REMARKS/ARGUMENT

This Preliminary Amendment is being submitted to change the multiple dependent claims to single dependent claims in order to reduce the government filing fee.

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail to Addressee (mail label # EL924389514US) in an envelope addressed to: U.S. Patent and Trademark Office, P.O. Box 2327, Arlington, VA 22202 on January 3, 2002:

Dorothy Jenkins
Name of Person Mailing Correspondence

Dorothy Jenkins
Signature

January 3, 2002
Date of Signature

Respectfully submitted,

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APPENDIX A

"CLEAN" VERSION OF EACH PARAGRAPH/SECTION/CLAIM
37 C.F.R. § 1.121(b)(ii) AND (c)(i)

CLAIMS (with indication of amended or new):

(Amended) 6. Spray head according to Claim 4, characterized in that the seal (4) has an indentation (41) such that the ball-shaped central part (31) of the rotary element (3) rests on the two edges of the indentation (41).

(Amended) 20. Spray head according to Claim 1, characterized in that the top of the nozzle, when the latter is in its working position, is located at a distance of 1 to 5 mm from the top of the head.

APPENDIX B

VERSION WITH MARKINGS TO SHOW CHANGES MADE
37 C.F.R. § 1.121(b)(iii) AND (c)(ii)

CLAIMS:

6. Spray head according to [Claims 4 and 5] Claim 4, characterized in that the seal (4) has an indentation (41) such that the ball-shaped central part (31) of the rotary element (3) rests on the two edges of the indentation (41).

20. Spray head according to Claim 1 [or 2], characterized in that the top of the nozzle, when the latter is in its working position, is located at a distance of 1 to 5 mm from the top of the head.

5/pats

Spray head

The subject of the present invention is a spray head, especially for a high-pressure spray gun, comprising a rotary element, which is placed within a central body and through which passes a duct having a spray orifice, and a seal ensuring leak-tightness between the rotary element and the gun.

Patent Application PCT/CH97/00316 has a spray head for a high-pressure spray gun, comprising an element of cylindrical shape, which is mounted rotatably in a central body and through which passes a main conduit, at the end of which is mounted a spray nozzle delivering a tapered high-pressure fluid jet, two low-pressure air ducts being prolonged from the central body within the element of cylindrical shape on either side of the central conduit of the nozzle, the air-jet outlet orifices in the element of cylindrical shape being offset in relation to the inlet orifices in communication with the ducts of the central body.

Patent Application PCT/CH98/00104 has a spray head for a high-pressure spray gun, comprising a rotary element, which is placed in a central body and through which passes a duct having a spray orifice, and a seal ensuring leak-tightness between the rotary element and the gun, the rotary element having, in its central part, a spherical shape capable of cooperating with the seal placed within the central body, and two circular seats placed on either side of the spherical part bearing on the seats placed on either side of the central body.

The disadvantage of the spray heads known in the prior art is that the slit of the nozzle is at a level substantially equal to or lower than the top of the spray head, thus always resulting in interferences at the outlet of the fluid jet. Moreover, at the moment

when work is stopped, the liquid which has been unable to leave the gun falls down around the nozzle, and the user is therefore always faced with the need to clean it in order to prevent dry paint from accumulating around the slit of the nozzle and on the top of the spray head. The problem becomes even more acute when spray heads with additional air jets are used, since the air jets cause turbulence giving rise to fluid sedimentation deposits on the top of the head. These deposits are particularly troublesome, since they give rise to droplets which may be thrown on to the articles to be treated by the air jets.

The object of the present invention is to overcome these disadvantages and to propose a spray head, especially for a high-pressure spray gun, comprising a rotary element, which is placed in a central body and through which passes a spray nozzle, and a seal ensuring leak-tightness between the rotary element and the gun, characterized in that the rotary element has a circular central part comprising the nozzle and introduced into a lateral aperture of the central body, the circular central part being brought, by means of an upward translational movement of the central body, into a working position against at least one inner abutment located at the top of the central body, the nozzle placed in the circular part of the rotary element being in the working position above the top of the central body.

With the possibility of bringing the circular central part towards the top of the head by means of a translational movement, the nozzle placed on the central part can be raised and emerge from the top of the head. This will limit the accumulation of paint on the appliance during use and also the residual deposits of the fluid which are liable to cause smearing of the articles to be sprayed or to be covered.

By means of the arrangement proposed according to the current invention, the nozzle can be induced to exceed the height of the top of the head by a distance of 1 to 5 mm.

According to a preferred embodiment, the central part of the rotary element has at least one lateral shoulder taking the form of a spindle which cooperates with a groove-shaped prolongation of the lateral aperture of the central body, the groove of the central body making it possible, after the rotary element is introduced into the central body, to displace the rotary element towards the top of the central body, until the shoulder comes to bear against the inner abutment of the top of the central body.

According to this same embodiment, the central part of the rotary element has a second shoulder of the central part, said second shoulder being opposite the first and likewise taking the form of a spindle, the second shoulder cooperating with a groove made on the other side of the central body. The seal ensuring leak-tightness between the central body and the gun slides in a bore made in the spindle and at the base of the central body, so as to come to bear against the circular central part of the rotary element.

Still according to this embodiment, the circular central part of the rotary element takes the form of a ball which cooperates with the seal within the central body.

In this case, the seal may advantageously have an indentation such that the ball-shaped central part of the rotary element rests on the two edges of the indentation.

In another embodiment, the circular central part of the rotary element takes the form of a cylinder which cooperates with the seal within the central body.

The central body advantageously has passing through it a series of ducts allowing a low-pressure air stream for setting the opening angle of the fluid taper emerging through the nozzle, the ducts being located on one side of the nozzle and on the other and forming at their outlet an acute angle to the central conduit of the nozzle.

The central body has two diametrically opposed stubs in its upper part, the central body having passing through it two complementary ducts which are prolonged within said stubs, with outlet orifices directing a low-pressure air stream substantially perpendicularly to the slit of the nozzle, against the pressurized fluid taper emerging from the nozzle, thus causing the atomization of said fluid taper.

The rotary element has a pin which butts against two rims in the central body so as to be positioned in two ways which correspond to the working configuration and the cleaning configuration of the nozzle. The rotary element is connected to a handle which makes it possible to rotate through 180° between the two respective working and cleaning positions. According to the preferred embodiment, the rotary element is made from steel, stainless steel or chrome steel which in all cases has undergone thermal treatment for hardening its surface; the nozzle is manufactured from hard metal, for example from tungsten carbide; the central body is made from anodized aluminium, from steel or from a synthetic material reinforced with carbon fibre, and the cylindrical seal is made from ferrous or non-ferrous metal or from reinforced composite material.

The drawing illustrates a spray head according to the invention by way of example.

In the drawing, Figure 1 shows a view of a spray head of one embodiment of the head, partially in section, together with all its component elements,

Figure 2 shows a top view of a rotary element of the head,

Figure 3 shows a side view of the rotary element of Figure 2, with a section through its central part,

Figure 4 shows a side view of the central body,

Figure 5 shows a section through the central body of Figure 1,

Figure 6 shows a top view of the central body with a spray nozzle within it,

Figure 7 shows a section through a detail of the central body along the line VII-VII of Figure 6,

Figure 8 is a top view of a variant of the head illustrated in Figures 1 to 7,

Figure 9 is a sectional view along the line IX-IX of Figure 8,

Figure 10 is a sectional view along the line X-X of Figure 8, and

Figure 11 is a sectional view along the line XI-XI of Figure 8.

The spray head 1 illustrated in the drawing comprises a central body 2 through which a rotary element 3 passes. A cylindrical seal 4 is introduced into an axial bore

4a made in the central body, so as to be capable of sliding freely in said bore. The lower end of the seal 4 has a recess 5a, into which is positioned an end seal 5 which has a central aperture 7a issuing onto a central bore 7 made in the cylindrical seal 4. The seal 4 has at its base a circular outer groove 6a, in which is placed an O-ring seal 6 intended for ensuring leak-tightness between the cylindrical seal 4 and the bore 4a of the central body 2. The central bore 7 of the seal 4 widens in the form of a funnel 8 in its upper part, so as to come to bear against the rotary element 3, as explained below.

The rotary element 3 comprises a central part 31 taking the form of a ball and two shoulders 32, 32a, taking the form of a spindle (see also Figure 3). The shoulders 32 and 32a have at their free end a truncated disc 33 and a disc 35 respectively. The truncated disc 33 comprises a pin 34, cooperating with a recess 34a made in the central body 2 and serving as an abutment. A rod 36 extends outwards from the disc 33, prolongs the shoulder 32 along the same axis and receives at its free end a handle 36a fastened by means of a pin 36b. Alternatively, the handle 36a may be integrally moulded from reinforced synthetic material.

The cylindrical seal 4 has on its inner surface a V-shaped indentation 41 in contact with the rotary element 3 which rests on the two edges of the indentation 41. This indentation may take the form, in section, of a V or of a U. Alternatively, it may be replaced by a circular seal 41a which will preferably be made from metal or from composite material.

Within the central part 31 (Figure 3) of the rotary element 3 is located a tungsten carbide spray insert or nozzle 37 and a hollow screw 39 which grips the insert 37 by means of an O-ring seal 38 which is placed between the nozzle and the screw which has a central

bore, not shown, and is tightened with the aid of a hexagon-head spanner. The slit of the insert 37 is placed in the direction of the axis of the rotary element 3.

The central body 2 (Figures 4 and 5) has a lateral aperture 21 which is prolonged upwards by a groove 22, a second lateral aperture 21a of smaller dimension being located on the opposite side to the first and likewise being prolonged by a groove, as in the case of the lateral aperture 21. Two stubs 23 are placed at the top of the central body, each having an outlet orifice 25 in the direction of the axis of the central body and substantially perpendicular to the latter. These orifices 25 are in communication with two ducts 24 which pass through the wall of the central body in the direction of its axis and which are substantially perpendicular to the outlet orifices 25. These ducts 24 are intended for delivering an air stream towards the top of the spray insert 37 at the base of the jet. Their outlet orifices 25 may be replaced by slits. Further ducts 28 pass through the walls of the central body 2 in the direction of its axis so as to have access to the respective outlet orifices 29 (Figures 6 and 7) which are placed at the top of the central body and form an acute angle to the taper which emerges through the slit of the nozzle. These four orifices 29 are intended for delivering an air stream which makes it possible to change the spray angle. Within each of these ducts 28, and at their base, is provided a thread 28a which makes it possible to introduce, by means of a hexagon-head spanner, screws 28b which are used as air throttles. They take the form of hollow screws with different bore diameters for the purpose of varying the air flow. All the screws 28b of the same set have the same bore diameter. It is clear that the ducts 24 may likewise be provided with the hollow screws 28b serving for setting the air flow.

In the lower part the central body 2 has a groove in the form of a circular ring 27 cooperating for connection to the gun and allowing the low-pressure air to pass to the ducts 24, 28. In general, the guns used in conjunction with the spraying nozzle just described have one setting of compressed air which will be fed into the annular groove 27. The setting of the compressed air flow through the orifices 25 and 28 will be determined by the choice of the bores for the hollow screws 28b. There are on the market gun models with two different air settings. In this case, it will be possible to feed separately the ducts 24 and the orifices 25 issuing onto the stubs and the other ducts 28 and their respective orifices 29.

During operation, the rotary element 3 is introduced into the central body 2 through the aperture 21, and the truncated disc 33 having a diameter greater than the aperture 21 fixes the position up to which the rotary element 3 can be introduced. The disc 35 will emerge on the other side of the central body 2 through the aperture 21a. At this moment, the shoulders 32, 32a can slide over the entire length of the grooves 22 towards the top of the central body 2, until said shoulders 32 strike the upper part of the notches 22. The rotary element 3 is then located at the top of the central body 2 and the spray nozzle 37 is above said top. The seal 4 slides within the bore 30 of the central body 2 so as to ensure leak-tightness between the latter and the gun which is not illustrated in the drawing. The indentation 41 of the cylindrical seal 4 ensures greater leak-tightness, since the central part 31 of the rotary element 3, said central part being ball-shaped in the drawing, rests on the two edges of the indentation 41. In order to ensure this leak-tightness more effectively, the cylindrical seal 4 has at its base the end seal 5 made from polyamide plastic (nylon), which connects the head 1 to the gun, and the

O-ring seal 6 made from Viton, which cooperates with the central body 2 within its bore 30.

When the spray head 1 is in its working position, as shown in Figure 1, the high-pressure fluid arrives by way of the bores 7a, 7 and continues its path through the screw 39 and the nozzle 37 which are connected by means of the O-ring seal 38 made of Teflon. The fluid, which will emerge in the form of a taper through the spray nozzle 37, can be set by the addition of the low-pressure air by means of the two series of ducts (24, 28) which extend in the direction of the axis of the central body and within its walls. The pressurized air passes through the two ducts 24 coming from the groove 27 at the base of the central body 2 and arrives at the outlet orifices 25 which form a substantially right angle to the ducts, the low-pressure air being thrown substantially perpendicularly against the high-pressure fluid taper which emerges through the slit of the nozzle 37, thus reinforcing the atomization of said fluid taper by this supply of air. The low-pressure air likewise arrives at the ducts 28 which also extend from the base of the central body 2 and travels within the walls of said central body 2 in order to arrive at the orifices 29 which have an inclination in relation to the ducts 28. The low-pressure air passes through the ducts 28 and emerges on one side of the nozzle 37 and on the other, at the same time forming an acute angle to the central conduit of the nozzle 37, so as to make it possible to set the opening angle of the fluid taper which emerges through the nozzle 37.

With the aid of the handle 35, the rotary element can rotate through 180°, and the nozzle 37 is then placed in such a way that its slit confronts the outlet of the bore 7 and is ready to be cleaned. This operation is very simple, since the pin 34 butts against the rims 26 of the recess 34a in the two opposite positions, in each case placing the rotary element 3 accurately.

The variant of the head illustrated in Figures 8 to 11 comprises a central body 2, through which passes a rotary element or key, not illustrated, which is identical to the element 3 of the embodiment of Figures 1 to 7 and is provided with a seal, likewise not illustrated, which is identical to the seal 4 of Figures 1 to 7. In Figures 8 to 11, only the central body 2 has been illustrated, on the understanding that all the elements forming the central body and all the elements forming the head 2 and participating in the operation of the latter are the same as those in the embodiment of Figures 1 to 7.

The head 2 of Figures 8 to 11 therefore again has the lateral aperture 21 which is prolonged upwards by a groove 22 allowing the rotary element or key 3 to be introduced into the head 2 and brought into the working position by means of an upward translational movement in the groove 22, as illustrated in Figure 11. The two stubs 23 placed at the top of the head 2 likewise have the outlet orifice 50 which, in the variant, takes the form of a slit directing the additional atomizing air at an angle of approximately 12° in relation to the axis of the head. This angle of 12° may, of course, vary within a range from 0 to 20°, if action is to be taken on the jet at the outlet of the nozzle or a little higher. This angle will also depend on the height between the top of the nozzle and the top of the head, said height being in the range of 1 to 5 mm.

As in the embodiment of Figures 1 to 7, the atomizing orifices 50 are fed by the ducts 24 identical to those of the embodiment of Figures 1 to 7.

Still as in the embodiment of Figures 1 to 7, the ducts 28 (Figures 8 and 11) are connected to the outlet orifices 29 issuing at the top of the head 2. In the variant illustrated, there are two outlet orifices 29;

they may, however, be more numerous, for example 4 or 6. As in the embodiment of Figures 1 to 7, these outlet orifices 29 are intended for the additional air opening the sheaf of the main jet to a greater or lesser extent. If there are 4 of them, they will issue on either side of the axis XI-XI of the section of Figure 11. If there are 6 ducts, they will be placed on either side of the ducts 28 of Figure 8. As illustrated in Figure 11, the outlet orifices 29 form an angle to the vertical axis of the head which varies within a range of 45 to 60°. In the variant of Figure 11, the angle is 50°.

Finally, in the variant of Figures 8 to 11, the rotary element or key 3 is introduced into lateral apertures 21 of the head 2 which form an axis of 45° (axis IX-IX of the section of Figure 9) in relation to the two stubs 23 (line X-X of Figure 8). Thus, the nozzle 51 (Figure 8) will be placed at 45° in relation to the axis of the rotary element or key 3. This arrangement is advantageous because it allows an easier distribution of the additional air ducts and consequently a simpler manufacture of the head.

The embodiment of Figures 1 to 7, and also the variant of Figures 8 to 11, comprises a rotary element taking the form of a ball partially introduced into a funnel-shaped part located within the seal 4. As mentioned above, an indentation 41 is placed on the periphery of the funnel at the location where the spherical surface of the ball 31 is in contact with the interior of the seal. This indentation 41 may be produced by machining or moulding or by chasing the material of said seal. Alternatively, the indentation 41 may be replaced by a covering taking the form of a circular zone 41a inlaid within the cone, the zone 41a being in contact with the ball of the rotary element.

Although the embodiment and the variant which have just been described both have a rotary element or key 3 comprising a ball 31 placed between the two spindles 32 and 32a, it is clear that the invention is not limited to this solution and that the ball may be replaced by a cylinder or a concave circular surface. The seal 4 will then be matched to this surface by any means known to a person skilled in the art.

A central body 2 is produced from anodized aluminium; it may, however, by manufactured from stainless steel, from chrome steel or from plastic reinforced, for example, with carbon fibres.

The rotary element 3 and the seal 4 may likewise be produced from metal, from reinforced plastic or from ceramic.

Claims

1. Spray head (1), especially for a high-pressure spray gun, comprising a rotary element (3), which is placed in a central body (2) and through which passes a spray nozzle (37), and a seal (4) ensuring leak-tightness between the rotary element (3) and the gun, characterized in that the rotary element (3) has a circular central part (31) comprising the nozzle (37) and introduced into a lateral aperture (21) of the central body (2), the circular central part (31) being brought, by means of an upward translational movement of the central body (2), into a working position against at least one inner abutment located at the top of the central body (2), the nozzle (37) placed in the circular part (31) of the rotary element (3) being in the working position above the top of the central body (2).

2. Spray head according to Claim 1, characterized in that the central part (31) of the rotary element (3) has at least one lateral shoulder (32) taking the form of a spindle which cooperates with a groove-shaped prolongation (22) of the lateral aperture (21) of the central body (2), the groove (22) of the central body (2) making it possible, after the rotary element (3) is introduced into the central body (2), to displace the rotary element (3) towards the top of the central body (2), until the shoulder (32) comes to bear against the inner abutment of the top of the central body (2).

3. Spray head according to Claim 2, characterized in that the rotary element (3) has a second shoulder (32a) of the central part (31), said second shoulder being opposite the first (32) and likewise taking the form of a spindle, the second

shoulder (32a) cooperating with a groove made on the other side of the central body (2).

4. Spray head according to Claim 1, characterized in that the seal (4) ensuring leak-tightness between the central body (2) and the gun slides in a bore (30) made in the spindle and at the base of the central body (2), so as to come to bear against the circular central part (31) of the rotary element (3).

5. Spray head according to Claim 4, characterized in that the circular central part (31) of the rotary element (3) takes the form of a ball which cooperates with the seal (4) within the central body (2).

6. Spray head according to Claims 4 and 5, characterized in that the seal (4) has an indentation (41) such that the ball-shaped central part (31) of the rotary element (3) rests on the two edges of the indentation (41).

7. Spray head according to Claim 4, characterized in that the circular central part (31) of the rotary element (3) takes the form of a cylinder which cooperates with the seal (4) within the central body (2).

8. Spray head according to Claim 1, characterized in that the central body (2) has passing through it a series of ducts (28) allowing a low-pressure air stream for setting the opening angle of the fluid taper emerging through the nozzle (37), the ducts (28) being located on either side of the nozzle (37) in the direction of the slit.

9. Spray head according to Claim 1, characterized in that the central body (2) has two diametrically

opposed stubs (23) in its upper part, the central body (2) having passing through it two complementary ducts (24) which are prolonged within said stubs (23), with outlet orifices (25) directing a low-pressure air stream substantially perpendicularly to the slit of the nozzle (37), against the pressurized fluid taper emerging from the nozzle (37), thus causing the atomization of said fluid taper.

10. Spray head according to Claim 1, characterized in that each duct (24, 28) has within it, and at its base, a thread (28a) which makes it possible to introduce an interchangeable hollow screw (28b) with different bore diameters.

11. Spray head according to Claim 1, characterized in that the rotary element (3) has a pin (34) which butts against two rims (26) in the central body (2) so as to be positioned in two ways which correspond to the working configuration and the cleaning configuration of the nozzle (37).

12. Spray head according to Claim 1, characterized in that the rotary element (3) is connected to a handle (35) which makes it possible to rotate through 180° between the two respective working and cleaning positions.

13. Spray head according to Claim 1, characterized in that the rotary element (3) is made from steel, stainless steel or chrome steel.

14. Spray head according to Claim 1, characterized in that the nozzle (37) is manufactured from hard metal, for example from tungsten carbide.

15. Spray head according to Claim 1, characterized in that the rotary element (3) comprises an O-ring

seal (38) which is manufactured from Teflon and which connects the nozzle (37) to a clamping screw (39).

16. Spray head according to Claim 1, characterized in that the central body (2) is manufactured from anodized aluminium, from steel or from a synthetic material reinforced with carbon fibre.

17. Spray head according to Claim 6, characterized in that the seal (4) passing through the central body (2) is manufactured from stainless steel or from a reinforced composite material.

18. Spray head according to Claim 1, characterized in that it has a seal (5) made from polyamide plastic (nylon) connecting the seal (4) which passes through the central body (2) to the gun.

19. Spray head according to Claim 1, characterized in that the seal (4) passing through the central body (2) comprises an O-ring seal (6) which ensures leak-tightness in relation to the central body (2).

20. Spray head according to Claim 1 or 2, characterized in that the top of the nozzle, when the latter is in its working position, is located at a distance of 1 to 5 mm from the top of the head.

21. Spray head according to Claim 9, characterized in that the outlet orifices (25, 50) of the two stubs (23) are arranged so as to direct the additional atomizing air at an angle of 0 to 20° in relation to the axis of the head.

22. Spray head according to Claim 8, characterized in that the outlet orifices of the ducts (28) are

arranged so as to direct the additional air, making it possible to close and open the angle of the fluid taper, at an angle of 45° to 60° in relation to the vertical axis of the head.

23. Head according to Claim 1, characterized in that the rotary element or key (3) is introduced into the head along an axis perpendicular to the line connecting the two stubs (23) placed at the top of the head (2), the slit of the nozzle likewise being perpendicular to this line (Figures 1 to 7).

24. Head according to Claim 1, characterized in that the rotary element or key (3) is introduced into the head (2) along an axis of 45° in relation to the line connecting the two stubs (23) placed at the top of the head (2), the slit of the nozzle forming an angle perpendicular to this line (Figures 8 to 11).

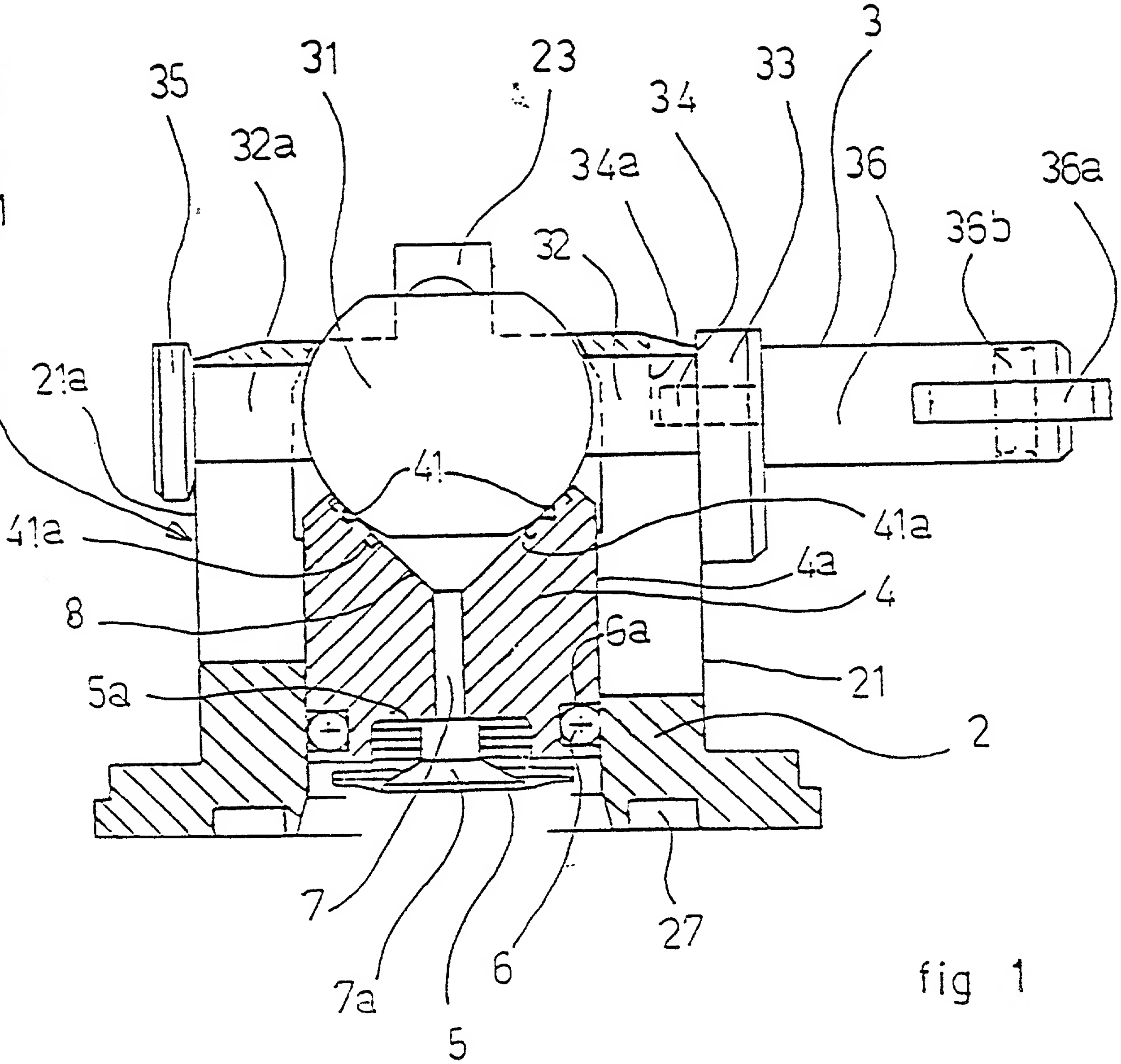

fig 1

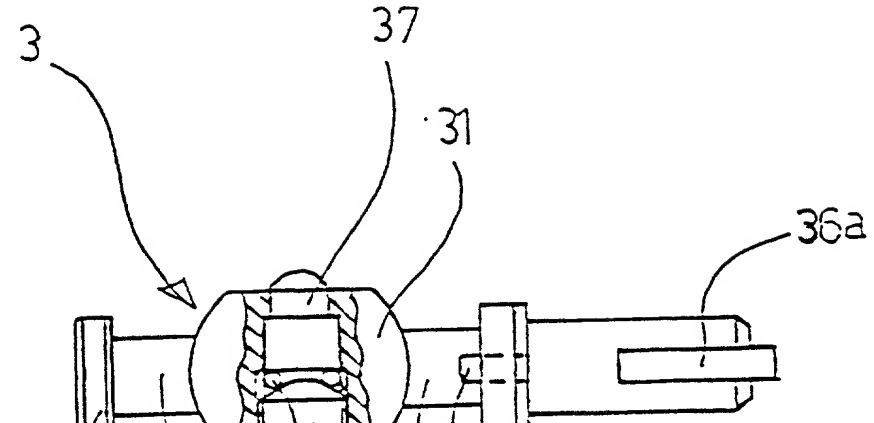

fig 3

fig 2

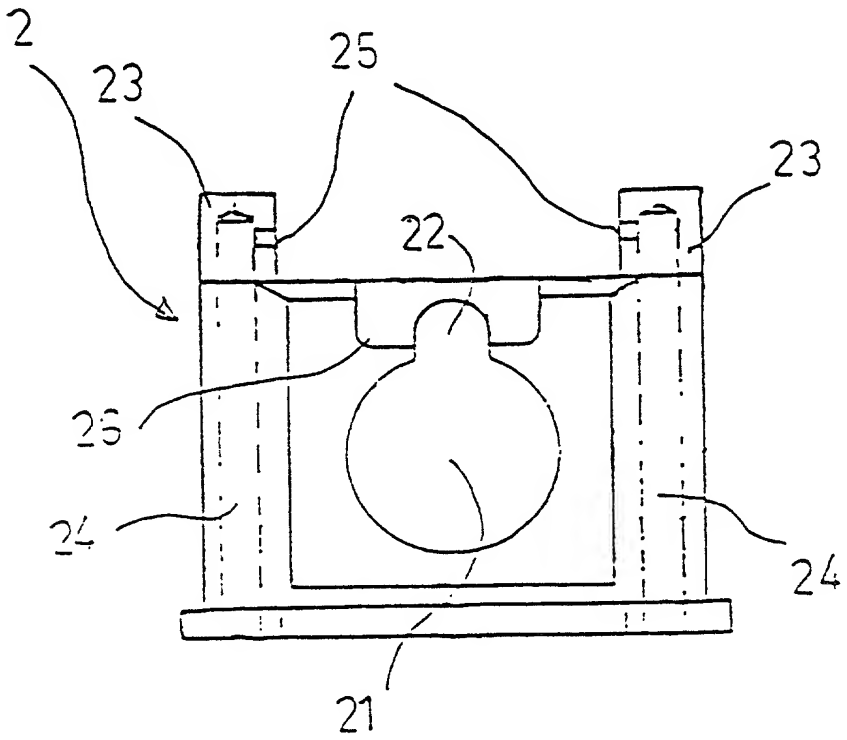

fig 4

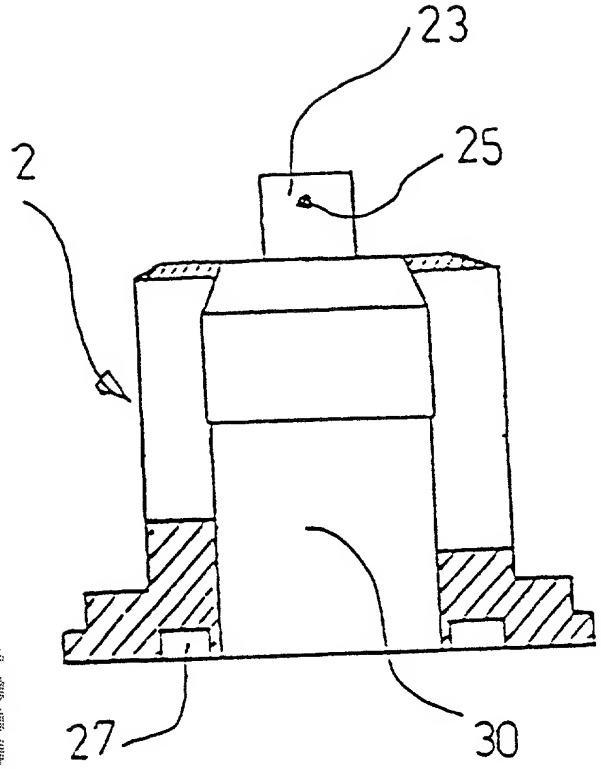

fig 5

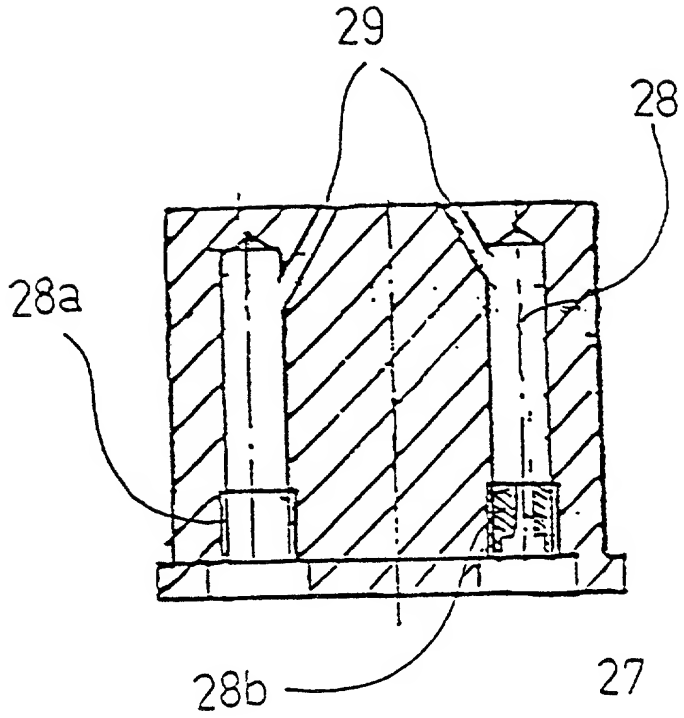

fig 7

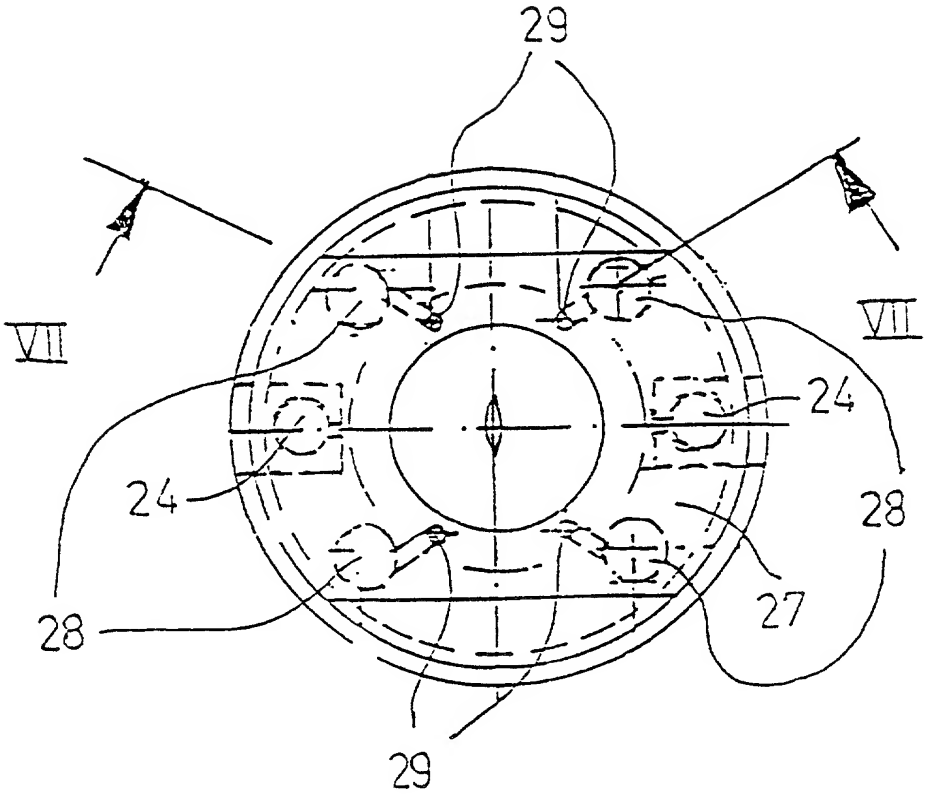

fig 6

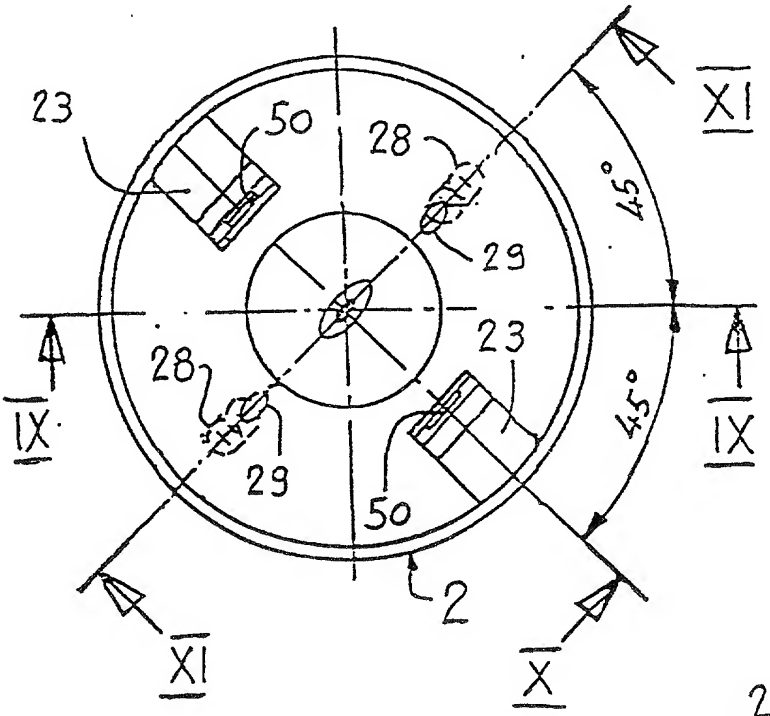

fig 8

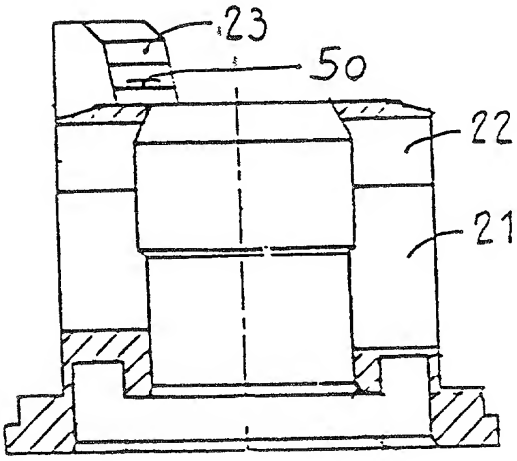

fig 9

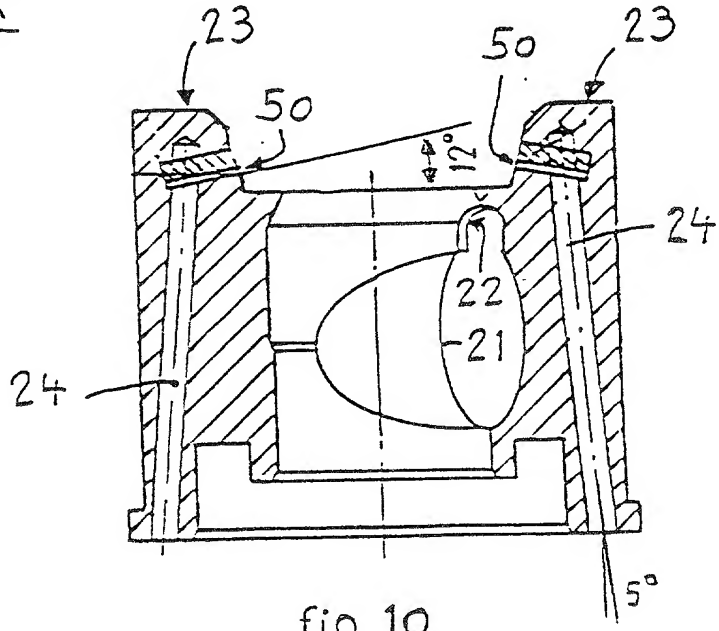

fig 10

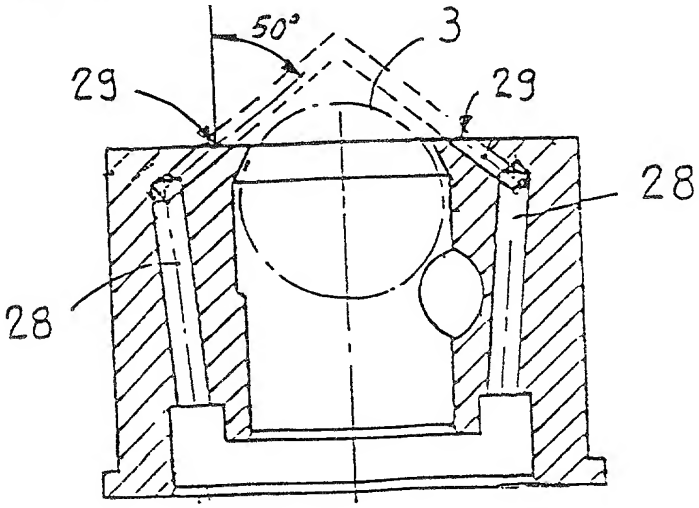

fig 11

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION	OPGS FILE NO. P/231-140

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named) of the subject matter which is claimed and for which a patent is sought on the invention entitled,

SPRAY HEAD

the specification of which is attached hereto, unless the following box is checked:

☒ was filed on 17 May 2000 as United States patent Application Number or PCT International patent application number PCT/CH00/00274 and was amended on _____ (if any)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information known to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate or United States provisional application(s) listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign or Provisional Application(s)

COUNTRY	APPLICATION NUMBER	DATE OF FILING *(day, month, year)*	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Switzerland	CH 1244/99	7 July 1999	YES X NO ___
			YES ___ NO ___

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

UNITED STATES APPLICATION NUMBER	DATE OF FILING *(day, month, year)*	STATUS *(patented, pending, abandoned)*

I hereby appoint customer no. 2352 OSTROLENK, FABER, GERB & SOFFEN, LLP, and the members of the firm, Samuel H. Weiner - Reg. No 18,510; Jerome M. Berliner - Reg. No 18,653; Robert C. Faber - Reg. No. 24,322; Edward A. Meilman - Reg. No. 24,735; Steven I. Weisburd - Reg. No. 27,409; Max Moskowitz - Reg. No. 30,576; Stephen A. Soffen - Reg. No. 31,063, James A. Finder - Reg. No. 30,173; William O. Gray, III - Reg. No. 30,944; Louis C. Dujmich - Reg. No. 30,625, Douglas A. Miro - Reg. No. 31,643, and Michael J. Scheer - Reg. No. 34,425, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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